(19) **JAPANESE PATENT OFFICE (JP)**

(11) **Japanese Laid-Open Patent Application (Kokai) No. H4-8381**

(12) **Official Gazette for Laid-Open Patent Applications (A)**

(51) Int. Cl.[5]	Classification Symbols	JPO File Nos.
A 63 F 9/24	A	8102-2C

(43) Disclosure Date: January 13, 1992

Number of Claims: 1

Request for Examination: Submitted

(Total of 7 pages [in original])

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(54) Title of the Invention: Tactile Sensation Game Machine

(21) Application No.: H2-109714

(22) Filing Date: April 25, 1990

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SPECIFICATION

1. TITLE OF INVENTION

Tactile Sensation Game Machine

2. CLAIMS

A tactile sensation game machine, wherein a target image screen is provided at the front surface of a base mounted inside an outside spherical surface's mounting cylinder and a hit switch for generating vibration when hits occur is provided at the rear surface and they can oscillate vertically and laterally respectively; a pursuit scope corresponding to said target image screen and a tactile sensation lever having a trigger member linked to said switch are respectively provided at a control body that can oscillate along the mounting cylinder's outside spherical surface; and the vibration amplitude of the tactile sensation lever is changed by an amplitude variation means when firing and when hitting.

3. DETAILED DESCRIPTION OF THE INVENTION

Industrial Field of Utilization

The present invention pertains to a tactile sensation game machine that simulates controlling and operating a spacecraft fighter or automobile or the like and makes it possible to enjoy the sensation of controlling them.

Prior Art

A tactile sensation game machine performs predetermined control in response to a changing screen that simulates high-speed driving or space battles, for example, and enables one to enjoy control techniques and the sensation of shooting and so forth, so in recent years it has become popular as a game machine enjoyed by young and old.

In this type of tactile sensation game machine, a mechanical vibration transmitted via a control lever, handle, steering wheel, etc. (hereinafter "tactile sensation member") when controlling/operating or shooting is an important factor in providing a feeling of being there that corresponds to the screen. Therefore so-called game centers and the like have implemented devices that incorporate large-size screens into cockpits that are almost as big as the real thing and provide tactile sensation vibration by means of large-size motors or hydraulic devices. Meanwhile, tactile sensation game machines [played] on a desktop that enable one to enjoy a game overflowing with the feeling of being there are continuing to spread in the field of everyday toys. In this case, particularly in space battle games and so forth that incorporate combat scenes, it is sometimes the case that the characteristics of the tactile sensation vibration that impart a feeling of gravity and a feeling of speed determine its appeal as a game machine.

Therefore various means have been proposed to provide change to mechanical vibration. For example, an improvement that has been considered is linking a plurality of motors to a tactile sensation member and suitably switching the vibration characteristics of the tactile sensation member when changing the control mode, thus generating a more realistic tactile sensation vibration.

Problems the Invention Is to Solve

Nevertheless, the aforesaid conventional tactile sensation game machine requires individual mechanisms consisting of motors and vibration generating members linked to the motors for each type of tactile sensation vibration mode, so the device may become large, complicated, and expensive.

The present invention considered these points. Its object is to provide a tactile sensation game machine provided with a vibration generating means that can generate various vibration modes with a simple mechanism.

Means for Solving the Problems

In order to achieve the aforesaid object, the present invention is constituted so that a target image screen is provided at the front surface of a base mounted inside an outside spherical surface's mounting cylinder and a hit switch for generating vibration when hits occur is provided at the rear surface and they can oscillate vertically and laterally respectively; a pursuit scope corresponding to the aforesaid target image screen and a tactile sensation lever having a trigger member linked to the aforesaid switch are respectively provided at a control body that can oscillate along the mounting cylinder's outside spherical surface; and the vibration amplitude of the tactile sensation lever is changed by an amplitude variation means when firing and when hitting. A plurality of tactile sensation vibrations can be generated with a single vibration generating means, and it is possible to implement a tactile sensation game machine that is small and simple.

Embodiment

Below, the present invention shall be explained based on the embodiment shown in the attached drawings.

FIG. 1 is an oblique view of the entirety of this application's tactile sensation game machine. FIG. 2 is an oblique view with a partial cut-out of the same. FIG. 3 is an oblique view showing the structure of the base and oscillation mechanism. FIG. 4 is an oblique view showing the structure of the tactile sensation vibration switch's pressing means. FIG. 5 is a sectional view showing the relationship between the base and pursuit body. FIG. 6 is a sectional view showing the relationship between the tactile sensation vibration switch's pressing means and the base. FIG. 7 is an oblique view showing the structure of the amplitude variation means. FIGS. 8(a) and (b) are drawings explaining the cam's amplitude variation principle.

In the drawings, 1 is a stand. The stand 1 houses a battery accommodation chamber and sound-generating circuits, etc. (not shown in the drawing); support columns 1a are provided at both sides. The stand 1 permits the main body 100 of this application's game machine to be stably supported on a desktop.

Item 2 is a mounting cylinder; the mounting cylinder 2 consists of a shell body whose outside has a spherical surface and having apertures 2a and 2b at the front and back. Its two ends are mounted on the aforesaid stand 1's support columns 1a.

Item 3 is a base. The base 3 is provided with a bracket-shaped frame body 31 mounted inside the aforesaid mounting cylinder 2; a target image screen 4 is provided in the front end of the member 31 and a hit switch 5 is provided in the back end with an oscillation mechanism 6 therebetween respectively. The target image screen 4 consists of a rotary disk made of transparent plastic; printed thereon are images corresponding to the

game contents: for example, target image M_1 of silhouettes of fighters flying in formation, etc. The hit switch 5 is for operating the sound and vibration generating circuit when there is a hit; it oscillates vertically and laterally relative to the body 3, so it goes on only when it matches the same straight line as a trigger member 9 to be described later.

The aforesaid oscillation mechanism 6 is provided with two oscillation arms and two drive cams; it is constituted so that it can oscillate the aforesaid target image screen 4 and hit switch 5. That is, in FIG. 3, 61 is a first oscillation arm; the first oscillation arm 61 consists of a nearly bracket-shaped frame body whose upper piece 61a is longer than the lower piece 61b, and is disposed in a nested manner with the aforesaid bracket-shaped frame body's base 3 and pivotally supported by shafts J_1 and J_1 so that it can oscillate. The oscillation arm 61's upper piece 61a is provided with a long hole N_1 in the front part; an eccentric rotary disk 62 is fitted into the long hole N_1. Also, the first oscillation arm 61 is constituted so that it can oscillate laterally in response to the rotation of the eccentric rotary disk 62.

Item 63 is a second oscillation arm; the second oscillation arm 63 also consists of a nearly bracket-shaped frame body, and is pivotally supported by a shaft J_2 at a center piece 61c of the aforesaid first oscillation arm 61 so that it can oscillate. The second oscillation arm 63 is respectively provided with the aforesaid target image screen 4 at its front end and the aforesaid hit switch 5 at its back end, with a pin P_1 and long hole N_2 interposed, and a pin P_2 parallel to the aforesaid shaft J_2 at the side of the center piece 61c. The pin P_2 is for driving the second oscillation arm 63, so it is fitted into an indentation 64a in a cam follower 64 that is pivotally supported at the upper part of the base 3 by the aforesaid shaft J_1. The cam follower 64 is anchored to an irregularly curved cam 65 that is capable of forming a complicated oscillation pattern. Here, the irregularly curved cam 65 is pivotally supported and integrated with a gear G_1; it is driven via a gear G_2, which is integrated with the aforesaid eccentric rotary disk 62 and meshes with the gear G_1. Also, the gear G1 and irregularly curved cam 65 rotate due to the rotation of the eccentric rotary disk 62 and gear G_2, as a result of which the cam follower 64 oscillates irregularly, and furthermore the pin P_2 is driven forward and in reverse (relative to the base 3) via the cam follower 64's indentation 64a. Therefore the second oscillation arm 63 oscillates irregularly in a vertical direction relative to the base 3 centered on the shaft J_2.

The lateral oscillation of the first oscillation arm 61 and the vertical oscillation of the second oscillation arm 63 are combined in this manner, so the target image screen 4 at the front end of the second oscillation arm 63 is constituted so that it oscillates irregularly in both vertical and lateral directions.

Furthermore, a light-emitting lamp L is provided behind the target image screen 4 (inside the aforesaid base 3), and is constituted so that the image screen 4 is illuminated by the light-emitting lamp L. Also, a transparent disk T, for example, printed with a background image such as the entirety of a space city, etc., is provided between the target image screen 4 and light-emitting lamp L; it rotates at a constant speed and creates an constantly changing background.

The aforesaid hit switch 5 is for generating the sound and vibration when there is a hit, so it consists of a plate-like member 51 provided at the back end of the aforesaid second oscillation arm 63 with the pin P_1 and long hole N_2 interposed. A pressing part 5a is provided at its back end and a reflecting mirror 5b is provided at its front end. The switch 5 oscillates irregularly vertically and laterally due to the combined oscillation of the first oscillation arm 61 and second oscillation arm 63 as described earlier, so it is constituted so that it is operable only when a pressing member 9f to be described later is set on the same line. Then, when pressing occurs, a sound and vibration generating circuit (not shown in the drawing) is connected to a predetermined mode, the aforesaid reflecting mirror 5b is brought near the light-emitting lamp L, and the backlight of the target image screen 4 rapidly becomes bright. Item B is a spring that tensions the member 51 in the projecting direction.

Item 7 is a control body; the control body 7 is provided with a guide part 7a along the outer spherical surface of the aforesaid mounting cylinder 2, and consists of a shell body 71 covering the outside of the mounting cylinder 2. Oscillation (in polar coordinates) is possible in any direction relative to the mounting cylinder 2 via this guide part 7a (FIG. 4, FIG. 5, FIG. 6). Also, the control body 7's shell body 71 is provided with a pursuit scope 8 corresponding to the aforesaid target image screen 4 and with a tactile sensation lever 10 that has a trigger member 9 that can be linked to the aforesaid switch 5 and with a vibration generating part 11. They are constituted so that the vibration of the tactile sensation lever 10 changes when firing and when hitting.

The aforesaid pursuit scope 8 is positioned at the front surface of the game machine main body, and consists of a window-shaped semi-transparent plate incised with an aiming mark M_2 in its center. It is constituted so that it freely oscillates integrally with the aforesaid control body 7. The scope 8's aiming mark M_2 overlaps the aforesaid target image screen 4's target image M_1 when the aforesaid trigger member 9 at the rear surface of the control body 7 and the aforesaid tactile sensation switch 5 match on the same line.

The aforesaid trigger member 9 sequentially links the pressing operation of a firing button 9a provided at the front of the aforesaid tactile sensation lever 10, and the aforesaid switch 5's pressing part 5a is pressed by a pressing member 9f at the rear. That is, when the firing button 9a, which is provided at the front of the tactile sensation lever 10 at the right side so that it can freely extend and sink, is pressed,

(1) A curved member 9b passing through the inside of the lever 10 is pressed to the interior,

(2) Because of this, a pin P_3 projectingly provided at its end causes an oscillating piece 9c to rotate relative to a shaft J_3,

(3) Because of this, the oscillating piece 9c's pin P_4 moves a plate-shaped member 9d toward the rear of the game machine,

(4) Because of this, the plate-shaped member 9d causes a moveable plate 9e to oscillate relative to a shaft J_4,

(4)[sic] Because of this, the pressing member 9f is moved to the front (toward the front of the game machine),

and the aforesaid pressing part 5a is pressed.

The aforesaid tactile sensation levers 10 and 10 are grip members for transmitting sound and vibration when a missile is launched and sound and vibration when there is a hit to the user of the game machine. They resemble the control lever of a fighter and are provided at both sides of the aforesaid control body 7. That is, the tactile sensation levers 10 and 10 consist of grip parts 10a and 10a projecting at the outside of the outer shell body 100, while fitted into long holes N_3 and N_3 provided at their ends is an amplitude variation cam 12 (amplitude variation means) of the aforesaid vibration generating part 11 provided inside the outer shell body of the main body 100; it can oscillate in response to the rotation of the amplitude variation cam 12 centered on the shaft J_3. Here the vibration generating part 11 is provided with an angular tube body 11a having a drive motor (not shown in the drawing) inside; it is provided in the center of the control body 7 along the direction toward the inside of the aforesaid mounting cylinder 2.

Here, the amplitude variation cam 12, as shown in FIG. 7 and FIG. 8, consists of a fan-shaped moveable piece 13 and a driven rotary body 14. The aforesaid tactile sensation levers 10 and 10 are oscillated at different amplitudes according to the forward and reverse movement of the drive piece 13.

The fan-shaped moveable piece 13 is provided with a standing drive pin P_5 that is linked to a motor in the aforesaid vibration generating part 11's angular tube body 11a at an eccentric location equivalent to the fan's "pivot"; it is constituted so that it can be rotated forward or in reverse by the motor (in the drawing, forward is direction a and reverse is direction b). In contrast to this, the driven rotary body 14 has a long hole N_4 to ensure a different eccentricity at each end; the drive pin P_3 [sic] of the drive piece 13 passes through it. The driven rotary body 14 is also provided with a bracket-shaped receiving member U that can lock with the front part of the rotation direction regardless of whether the drive piece 13 rotates forward or in reverse. Here, the long hole N_4 and the receiving member U are eccentrically provided relative to the center of the driven rotary body 14. Therefore they are constituted so that when rotating forward (direction a) as shown in FIG. 8(a), the center of the drive piece 13's pin P_3 [sic] and the center of the driven rotary body 14 establish eccentricity S_1 corresponding to one end of the long hole N_4, and when rotating in reverse (direction b) the center of the drive piece pin 13's pin P_3 [sic] and the center of the driven rotary body 14 establish eccentricity S_2 corresponding to the other end of the long hole N_4 (however, $S_1 < S_2$). That is, [this constitution] generates a small-amplitude vibration corresponding to small eccentricity S_1 when rotating forward and generates a large-amplitude vibration corresponding to large eccentricity S_1 [sic] when rotating in reverse, and this can be transmitted to the aforesaid tactile sensation levers 10 and 10.

Item 21 is a shoot-down counter. The counter 21 is provided at the front surface of the game machine main body 100 near the aforesaid vibration generating part 11; it is constituted so that is linked to the motor inside the vibration generating part 11 via a catch 20. The counter can rotate via the catch 20 only when the motor runs in reverse; moreover, it can rotate only by a fixed angle. That is, it is constituted so that it operates each time this application's game machine switches hit modes; the number of hits is incremented one by one, and displayed on the front surface of the main body 100.

Furthermore, this embodiment is constituted so that the small vibration when rotating forward imitates the firing vibration when firing a missile and the large vibration

when rotating in reverse imitates the shock vibration of a hit, and an imitation sound is simultaneously created, but of course the characteristics of this vibration and sound can be suitably modified according to the contents of the game.

In the aforesaid embodiment, when the stand 1 is set on a desktop, the pursuit scope 8 is positioned so that it is directly before the player and at an angle that is easy to see. When a power switch 15 is turned on, BG sounds suitable for a space game are generated, and the oscillation means 6 makes the target image screen 4 oscillate irregularly vertically and laterally in front of the background image T, which is rotating at a constant speed. Now the player grasps the tactile sensation levers 10 and 10 with both hands, and appropriately oscillates the pursuit body 7 [sic] so that the aiming mark M_1 on the pursuit scope 8 and the target mark M_2 on the target image 4 match. Then, when the mark M_1 and mark M_2 match, if the firing button 9a of the trigger member 9 is pressed with the right thumb, the member 9f is pressed toward the switch 5's pressing member 5a via members 9b, 9c, 9d, and 9e.

When this happens, if the centerlines of the member 9f and the member 5a do not match, the missile launch sound is created and the vibration generating part 11's motor rotates forward, and the fan-shaped rotary member 13 rotates the driven rotary body 14 via drive pin P_4 positioned at one end of the long hole N_4 by the receiving member U, and a small-amplitude vibration of eccentricity S_1 is transmitted to the tactile sensation levers 10 and 10.

On the other hand, if the centerlines of the member 9f and the member 5a successfully match, the member 51 moves toward the front and switches on in hit mode, and the reflecting mirror 5b moves near the light-emitting lamp L, and the background image T and target image 4 rapidly brighten; an explosion sound is simultaneously created. Then the motor in the vibration generating part 11 rotates in reverse, the driven rotary body 14 rotates with eccentricity S_2, and a large-amplitude [vibration] is transmitted to the tactile sensation levers 10 and 10 via the drive pin P_4 positioned at the other end of the long hole N_4. In addition, each time reverse rotation begins, the shoot-down marker 20 [sic] rotates the counter 21 by exactly the predetermined angle, and the number of shoot-downs is incremented one by one.

Effect of the Invention

The present invention, as described above, is characterized as being constituted so that a target image screen is provided at the front surface of a base mounted inside an outside spherical surface's mounting cylinder and a hit switch for generating vibration when hits occur is provided at the rear surface and they can oscillate vertically and laterally respectively; a pursuit scope corresponding to the aforesaid target image screen and a tactile sensation lever having a trigger member linked to the aforesaid switch are respectively provided at a control body that can oscillate along the mounting cylinder's outside spherical surface; and the vibration amplitude of the tactile sensation lever is changed by an amplitude variation means when firing and when hitting. Therefore the tactile sensation vibration can be changed in each mode—when pursuing, when firing, and when hitting—and interest in the game machine can be increased. Moreover, the amplitude variation means has a simple structure consisting of an eccentric member and a cam, so the device structure is also simple.

As a result, [the present invention] has an excellent effect in making it possible to provide a tactile sensation game machine that provides varied and realistic tactile sensation modes while keeping a simple and inexpensive device structure.

4. BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an oblique view of the entirety of this application's tactile sensation game machine. FIG. 2 is an oblique view with a partial cut-out of the same. FIG. 3 is an oblique view showing the structure of the base and oscillation mechanism. FIG. 4 is an oblique view showing the structure of the tactile sensation vibration switch's pressing means. FIG. 5 is a sectional view showing the relationship between the base and pursuit body. FIG. 6 is a sectional view showing the relationship between the tactile sensation vibration switch's pressing means and the base. FIG. 7 is an oblique view showing the structure of the amplitude variation cam. FIGS. 8(a) and (b) are drawings explaining the cam's amplitude variation principle.

1	Stand
2	Mounting cylinder
3	Base
4	Target image screen
5	Hit switch
5a	Pressing part
5b	Reflecting mirror
6	Oscillation mechanism
7	Control body
8	Pursuit scope
9	Trigger member
10	Tactile sensation lever
11	Oscillation generating means
11a	Angular tube body
12	Amplitude variation cam (vibration variation means)
13	Fan-shaped moveable piece
14	Driven rotary body
15	Power switch
20	Catch
21	Counter
31	Frame body
61	First oscillation arm
62	Eccentric rotary disk

64 Cam follower

65 Irregularly curved cam

71 Shell body

L Light-emitting lamp

P_1, P_2, P_3, P_4 Pin

N_1, N_2, N_3, N_4 Long hole

J_1, J_2, J_3, J_4 Shaft

S_1, S_2 Eccentricity

M_1 Target image

M_2 Aiming mark

U Receiving member

G_1, G_2 Gear

B Spring

T Transparent disk

Agent: Yukihiro Hamura, Patent Attorney [seal]

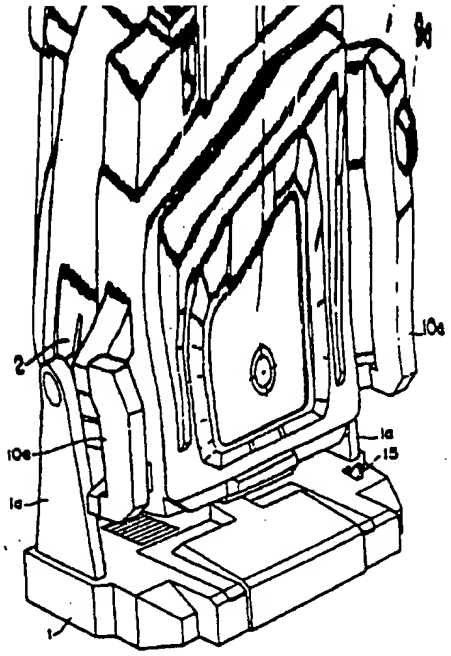

Figure 2

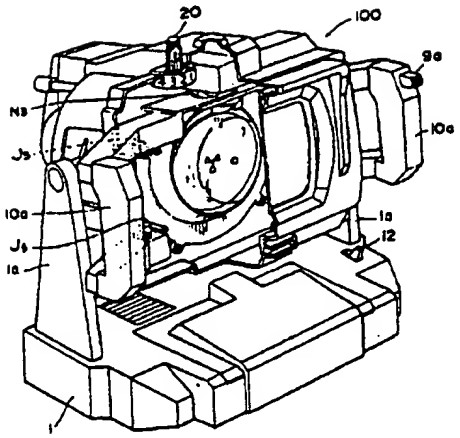

Figure 3

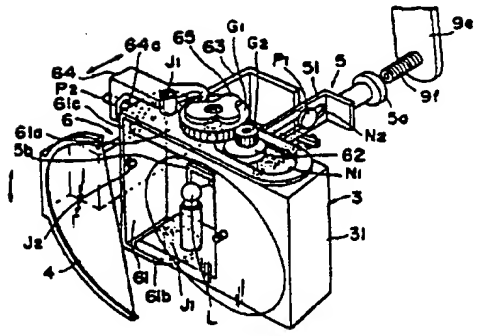

Figure 4

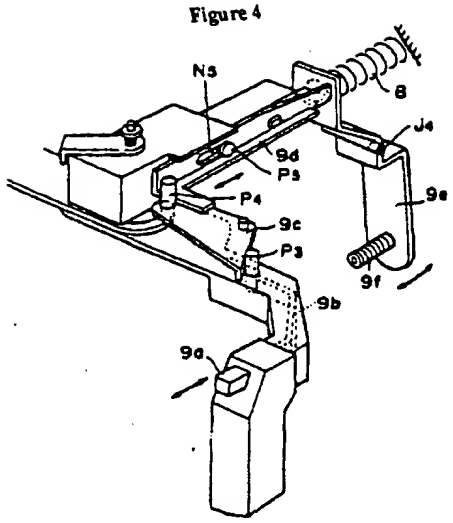

Figure 5

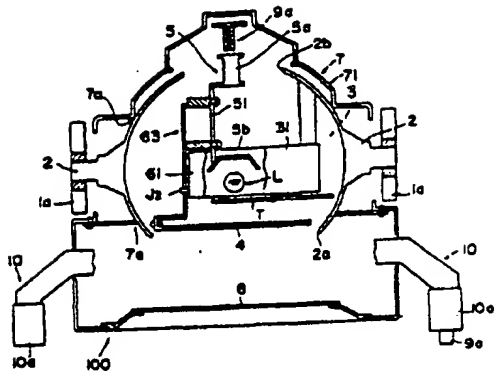

Figure 6

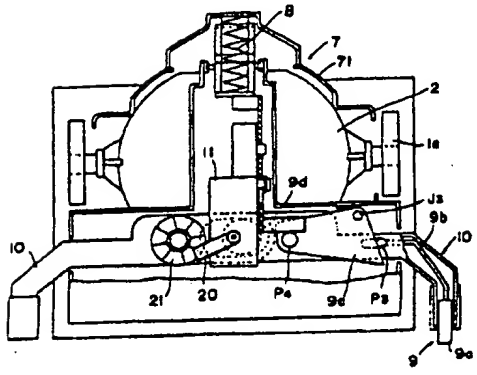

Figure 7

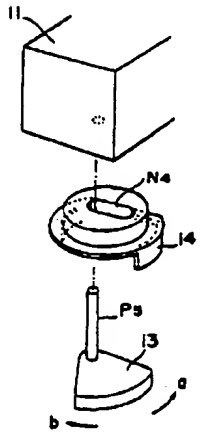

Figure 8